Before a Board of Inquiry
MacKays to Peka Peka Expressway Proposal

under: the Resource Management Act 1991

in the matter of: Notice of requirement for designation and resource consent applications by the NZ Transport Agency for the MacKays to Peka Peka Expressway Proposal

applicant: **NZ Transport Agency**
Requiring Authority

Statement of evidence of **Camilla Borger** (Air Quality) for the NZ Transport Agency

Dated: 5 September 2012

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STATEMENT OF EVIDENCE OF CAMILLA BORGER FOR THE NZ TRANSPORT AGENCY

QUALIFICATIONS AND EXPERIENCE

1 My full name is Camilla Elizabeth Borger.

2 I am an Associate in Environmental Engineering employed by Beca Infrastructure Ltd (*Beca*). I have an Honours Degree in Chemical and Process Engineering from the University of Canterbury, New Zealand and am a Chartered Chemical Engineer. I have 15 years' experience in air quality consulting and process engineering.

3 I have specialised in the following areas of air quality assessment:

3.1 Assessment of actual and potential effects of vehicle emissions, combustion source discharges, odour emissions and industrial air contaminants;

3.2 Ambient air quality monitoring and atmospheric dispersion modelling; and

3.3 Assessment, monitoring and mitigation options for dust discharges from construction activities.

4 I have conducted a significant number of air quality assessments for State Highway (*SH*) projects throughout New Zealand, including projects in Auckland (such as the Waterview Connection project, SH16 Te Atatu to Hobsonville, the Victoria Park Tunnel project, and the Newmarket Viaduct expansion), Tauranga (SH2/SH29 Hairini Link), Wellington (Transmission Gully), and Christchurch (Southern Motorway). I have also reviewed air discharge consent applications to provide expert assistance in the assessment of air discharges for both Auckland and Canterbury Regional Councils.

5 I am currently providing advice to Auckland Transport in assessing the air quality effects for Notices of Requirement for two transport projects, Auckland Manukau Eastern Transport Initiative (AMETI) and City Rail Link.

6 I have investigated and assessed air quality and odour issues for a wide range of industrial and municipal activities, including particulate emissions from NZ Steel and Pacific Steel in South Auckland and Waiuku, Ballance Agri-nutrients fertiliser manufacturing plant in Whangarei, Lion Breweries new brewery site in East Tamaki, and various wastewater treatment plants including Kawerau, Kawakawa Bay, Levin and Mangere.

7 My evidence is given in support of the Notice of Requirement (*NoR)* and applications for resource consent lodged with the Environmental Protection Authority (*EPA)* by the NZ Transport Agency (*the NZTA*)

for the construction, maintenance and operation of the MacKays to Peka Peka Expressway (*the Project)*.

8 I am familiar with the area that the Project covers and the state highway and local roading network in the vicinity of the Project.

9 I am the reviewer of the Assessment of Operational Air Quality Effects and the Assessment of Construction Air Quality Effects technical reports[1]; and of the Construction Air Quality Management Plan (*CAQMP*)[2], all of which formed part of the Assessment of Environmental Effects (*AEE)* lodged in support of the Project.

10 I have read the Code of Conduct for Expert Witnesses as contained in the Environment Court Consolidated Practice Note (2011), and I agree to comply with it as if this Inquiry were before the Environment Court. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

11 My evidence will deal with the following:

11.1 Executive Summary;

11.2 My background and role in this Project;

11.3 Description of the existing air quality;

11.4 Description of methodology;

11.5 Assessment of operational air quality effects of the Project;

11.6 Assessment of construction air quality effects of the Project;

11.7 Methods for managing effects;

11.8 Response to submissions;

11.9 Response to section 149G(3) key issues reports;

11.10 Response to the Board of Inquiry (*BoI*)'s section 92 request;

11.11 Proposed conditions; and

11.12 Conclusions.

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[1] Technical Reports 13 and 14 respectively.

[2] Appendix G to the Construction Environmental Management Plan (*CEMP*).

EXECUTIVE SUMMARY

Operational effects

12 A thorough scientific assessment has been undertaken of the potential operational air quality effects of the Project. This has included meteorological modelling, atmospheric dispersion modelling, and 12 months of pre-Project continuous ambient air quality monitoring at Raumati Road (200 metres from the alignment of the proposed Expressway).

13 The air quality assessment considered the potential effects of discharges of carbon monoxide (CO), fine particles (PM_{10} and $PM_{2.5}$),[3] nitrogen dioxide (NO_2) and benzene. Although these are not the complete suite of contaminants emitted from vehicles, I consider they are appropriate indicators of potential health effects from vehicle emissions.

14 The assessment shows that all of the relevant air quality standards and guidelines[4] would be met. The highest predicted ground level concentration of contaminants from vehicles using the proposed Expressway is less than 10% of any of the relevant, health-based standards and guidelines.

15 At some locations, the exposure of people living, working or spending time in the Project area to vehicle related contaminants will slightly increase. However, exposure levels in all areas comply with the Air Quality National Environmental Standards (*AQNES*)[5], which are designed to protect the health of the most vulnerable members of the community.

16 The proposed Expressway is forecast to improve the overall performance of the Kāpiti road network by improving average vehicle speeds, and reducing travelling times. As the harmful products of combustion from vehicles are greater when vehicle engines operate at variable speeds and during stop/ starts, maintaining a steady flow of traffic, as is generally the case when travelling on a motorway or expressway, will produce fewer contaminants than typical urban traffic flows.

17 The diversion of a significant proportion of traffic from the existing SH1 to the proposed Expressway, and the consequent reduction in

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[3] PM_{10} and $PM_{2.5}$ are airborne particulate matter with aerodynamic diameters less than 10 micrometres and 2.5 micrometres respectively.

[4] Air Quality National Environmental Standards (*AQNES),* NZ Ambient Air Quality Guidelines (*NZAAQG)*, Greater Wellington Regional Council's Ambient Air Quality Guidelines (*GWRC's AAQG*) and the World Health Organisation's (*WHO*) Air Quality Guidelines.

[5] Resource Management (National Environmental Standards for Air Quality) Regulations 2004 as amended in 2005.

congestion, will result in improved air quality for those residents and businesses located next to SH1.[6]

Construction effects

18 The assessment has also considered effects related to construction dust. Total suspended particulate (*TSP*) is the main indicator used to assess the effects of nuisance and amenity effects from dust, as well as potential impacts on sensitive ecosystems.

19 During the construction phase of the Project there may be nuisance dust and some construction traffic related exhaust emissions not present in the current environment.

20 The potential issues relating to dust include visual soiling of surfaces, such as cars, window ledges, and household washing, or dust deposits on flowers and gardens. Due to the proximity of the construction activities to residential areas, a high standard of control will be required through implementation of the CAQMP.

21 A dust monitoring programme is proposed as part of the CAQMP, to assist with the management of construction discharges. In my opinion, the potential effects from dust emissions during construction can be appropriately mitigated using the proposed management procedures.

22 I have read the submissions lodged on the Project which refer to air quality issues. Nothing in those submissions causes me to depart from the conclusions of my technical assessment, as contained in Technical Reports 13 and 14.

BACKGROUND AND ROLE

23 I have been involved as an air quality advisor to the Project since the Scheme Assessment stage which started in mid-2010, when the first option evaluation workshops commenced.

24 In my role, I have been responsible for:

24.1 Designing the scope of the technical assessment for air quality;

24.2 Formulating the dispersion modelling approach and reviewing the results;

24.3 Assessing the requirements for, and scoping the extent of, Project-Specific ambient air quality monitoring;

24.4 Detailing a CAQMP with recommended mitigation measures and monitoring programme for construction dust; and

[6] Technical Report 13, section 8.6.

24.5 Responding to an external review (by Emission Impossible Ltd), and advising on subsequent revisions to Technical Report's 13 and 14.

25 The primary technical assessment work and modelling was carried out by Dr Mathew Noonan and Mr Charles Kirkby, who are air quality specialists at Beca. The Assessment of Operational Air Quality Effects Report (*Technical Report 13*) and the Assessment of Construction Air Quality Effects (*Technical Report 14*) were completed by me and these authors.

26 The air quality analysis used the predicted traffic flow changes as one of its primary inputs. These are detailed in the Assessment of Traffic and Transportation Effects report[7], and are discussed in the evidence of **Mr Andrew Murray**.

EXISTING AIR QUALITY[8]

27 The entire Project area lies within the Kāpiti Coast airshed, which has been gazetted under the AQNES,[9] because ambient concentrations of PM_{10} within this area may exceed the AQNES threshold concentration of 50 $\mu g/m^3$.

28 The existing ambient air quality close to the route of the proposed Expressway is typical of a mixture of rural and urban receiving environments. The rural areas are expected to have very low existing levels of air quality pollutants, while the urban areas are impacted by PM_{10} emissions from home heating (mainly wood burners) during winter time.

29 Wind directions in the Project area are predominately northerly to northeasterly and southerly.

30 The Greater Wellington Regional Council (*GWRC*) undertook monitoring of PM_{10} and $PM_{2.5}$ particulates at a site on Glen Road, Raumati South (*GWRC Raumati South site*), during 9 weeks in June and July 2010.[10]

31 In January 2011, the Project team commenced a 12 month period of continuous pre-Project monitoring of particulate matter (PM_{10}), carbon monoxide (*CO*), and nitrogen dioxide (NO_2) at a site on Raumati Road, within 200m of the proposed Expressway (*Raumati*

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7 Traffic and Transportation Assessment of Effects, Technical Report 32.

8 Refer Section 3 in Technical Report 13 and Section 2 in Technical Report 14.

9 A gazetted airshed refers to "*a part of the region of a regional council [area] specified by the Minister [for the Environment] by notice in the Gazette to be a separate airshed"*. Regulation 3 of the AQNES.

10 Technical Report 13, section 3.5, page 12.

Road site).[11] No exceedances of the AQNES were measured at this site.

32 Maximum concentrations of PM_{10} measured at the Raumati Road site in 2011 are lower than those recorded at the GWRC Raumati South site.

33 Three exceedances of the AQNES (50 ug/m³) were recorded at the GWRC Raumati South site in the winter of 2010. The GWRC has published a detailed analysis of the results of monitoring undertaken at the GWRC Raumati South site, which clearly indicates a link to domestic solid fuel heating, influenced by the location of the monitoring site in a shallow depression (GWRC, 2011).[12]

34 The NZTA operates a network of passive diffusion samplers to monitor NO_2 in the vicinity of State highways across the country. One of these is located close to SH1 at Paraparaumu.[13]

35 The data described above has been used to predict the cumulative concentrations of PM_{10}, NO_2 and CO arising from vehicles using the future Expressway, combined with the existing state of air quality for the urban areas of the Project.

36 There is a limited amount of quantitative data available regarding ambient or background concentrations of dust in the Kāpiti Coast. Dust may be generated from a wide range of sources, both natural and manmade.

37 Soils across much of the Project area are sandy[14], with a consequently high potential to generate dust from exposed surfaces in dry, windy conditions.

38 The GWRC report on ambient air monitoring in Raumati South refers to previous airborne particulate monitoring carried out in rural Otaki in the summer of 1998-1999. During this period, there were occasional episodes of high particulate matter concentrations, most likely suspended soil particles arising from wind-borne alluvial fines from the nearby Otaki River bed.[15]

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11 Technical Report 13, section 3.5, page 13.

12 *"Raumati South (in particular the Glen Road area) is located within a low-lying area with topography that may be conducive to restricting the dispersion of polluntants under still and cold conditions."* Raumati South air quality investigation - Winter 2010 particulate matter concentrations and sources, p.4. GWRC,2011.

13 Technical Report 13, section 3.5, page 15.

14 Technical Report 23, Assessment of land and groundwater contamination effects.

15 Raumati South air quality investigation - Winter 2010 particulate matter concentrations and sources, p. 1. GWRC,2011.

METHODOLOGY[16]

Operational effects

39 The methodology used for assessing operational air quality effects follows the procedures outlined in the Ministry for the Environment (*MfE)*'s Good Practice Guide for Assessing Discharges to Air from Land Transport (2008) (the *MfE Transport GPG*) and the draft NZTA Standard for Producing Air Quality Assessments for State Highway Projects (2010).[17]

40 Dispersion modelling[18] was used as the primary tool to quantitatively assess contaminant concentrations associated with the Project, including the new sections of roading as well as changes in the existing road network at proposed interchanges.

41 Concentrations of PM_{10} and $PM_{2.5}$, NO_2, CO, and benzene, due to discharges to air associated with vehicles using the proposed Expressway, have been assessed.[19]

42 Potential effects were assessed by comparing predictions against relevant health-based National Standards (i.e. the AQNES), New Zealand Ambient Air Quality Guidelines (*NZAAQG*)[20] and GWRC's Ambient Air Quality Guidelines (*GWRC's AAQG*).[21]

43 The focus of the modelling assessment was on two key areas of the Project, which effectively represent "worst case" scenarios because they are areas where the increase in traffic volumes is expected to be greatest and the Expressway is closest to residential housing. The areas were:

43.1 Sector 1 in the vicinity of Leinster Avenue, and

43.2 Sector 2 in the vicinity of the Kāpiti Road interchange

44 The dispersion model inputs of vehicle emission rates and traffic volumes were derived using traffic modelling[22] and the Vehicle Emissions Prediction Model v3 (2009)[23] emission factors.

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16 Refer Section 5 in Technical Report 13 and Section 4 in Technical Report 14.

17 This document has subsequently been updated "Guide to assessing air quality effects for state highway asset improvement", Draft v0.5. June 2012. However, this update does not alter the conclusions of my assessment. This document is available on the NZTA website: http://air.nzta.govt.nz.

18 Refer section 7 in Technical Report 13.

19 Being the five indicator contaminants of emissions from vehicles identified by the MfE as having the highest potential to cause adverse effects. Refer Technical Report 13, Section 6.2.

20 Ambient Air Quality guidelines, MfE, 2002.

21 Regional Air Quality Management Plan for the Wellington Region, GWRC, 2002.

22 Traffic modelling data provided by **Mr Andrew Murray.**

45 The traffic modelling data represents the average weekday peak periods (AM, PM and interpeak).

46 As recommended in the MfE Transport GPG, a "high traffic day" scenario has also been considered.[24] A prediction of likely traffic volumes[25] on a "high traffic day" has shown that as the proposed Expressway is designed with more than sufficient capacity to be free flowing during the predicted vehicle flows in 2026, it is also predicted to be free flowing on a "high traffic day" scenario.

47 A total of four future scenarios have been assessed:

47.1 **2016 With Project** – represents the year of opening of the Expressway (and includes the impact on traffic flows of other roading projects in the region that are scheduled for completion by 2016).

47.2 **2016 Do Nothing** – assumes that all other forecast roading projects in the region, unrelated to the Expressway, have been completed, but that the Expressway itself has not been constructed.

47.3 **2026 With Project** and **2026 Do Nothing** – represent increased traffic volumes, future fleet composition and completed roading projects ten years after opening; both with and without the Expressway.

Construction effects

48 Potential air quality impacts from the construction of the Project, include potential effects of dust, odour, construction vehicle exhaust emissions and hazardous air contaminants.

49 Given the high degree of uncertainty in undertaking a quantitative assessment of effects of dust emissions, the approach recommended in the MfE's Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions (*MfE Dust GPG*) has been followed, which is to focus on the design and development of effective dust control procedures.

50 In line with this approach, a draft CAQMP has been prepared, which identifies areas that are particularly sensitive to dust emissions,

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[23] VEPM (5.0) released in 2012 is the latest version of this model. I have carried out a comparison between VEPM 3.0 and VEPM 5.0 (This is shown in **Annexure A** to my evidence). Whilst the predicted emission rates are different for carbon monoxide (CO), oxides of nitrogen (NOx) and PM10, PM10 emission rates are predicted to be lower using VEPM 5.0. As this is the key contaminant of concern, I am satisfied that VEPM 3.0 is sufficiently conservative.

[24] MfE Transport GPG, Section 8.1.2.

[25] Traffic flows could be 10% higher on a "high traffic day" than the average weekday periods.

significant dust generating activities, suitable control measures and key monitoring requirements.[26]

51 The assessment of air quality impacts from discharges of odour and hazardous air pollutants is based on the contaminated sites identified from field investigations, determining relevant health based criteria, determining whether these contaminants could become mobile via windblown dust and prescribing additional management controls in the event that contaminated soil is excavated during construction.[27]

ASSESSMENT OF OPERATIONAL AIR QUALITY EFFECTS OF THE PROJECT[28]

52 Concentrations of air pollutants from vehicles on surface roads decrease fairly rapidly with increasing distance from the road. Therefore, atmospheric dispersion models used for road sources only predict concentrations up to 200m from the carriageway. Consequently, assessments of air quality effects are typically also restricted to this distance.

53 The proposed route of the Expressway travels through a mixture of residential, open space and rural land uses. There are no schools, preschools or residential healthcare facilities within 200m of the proposed Expressway alignment.

54 There are a significant number of residential properties within 200m of the proposed alignment between Raumati Road and Mazengarb Road, as well as a small number where the Expressway crosses the end of Leinster Avenue. A number of these residential properties are within 50m of the proposed Expressway.

55 There are also some residential properties within 200m of the proposed alignment between the Waikanae River and Te Moana Road and a small number of houses between Te Moana Road and Peka Peka Road. The closest dwellings are approximately 75m from the proposed alignment.

56 The worst case location in the Project area - in terms of the combination of high traffic volumes and proximity to sensitive receptors, is likely to be the residential properties located near Kāpiti Road (between Arawhata Road and Milne Drive), which will have the highest traffic volumes of any section of road in the Project area.

57 The maximum predicted cumulative 24-hour average PM_{10} with the Expressway in operation is 36.3 µg/m^3, including effects of existing

[26] CEMP, Appendix G.

[27] Technical Report 14, Sections 4.4 and 7.

[28] Refer Section 8 in Technical Report 13.

background air quality sources. This is predicted to occur close to the Kāpiti Road Interchange, with contributions from both Expressway on and off-ramps and Kāpiti Road itself. The proportion of this maximum PM_{10} concentration which is related to vehicles using Kāpiti Road and the Expressway is 2.1 $\mu g/m^3$.[29] Predicted concentrations are all well below the AQNES level of 50 $\mu g/m^3$.

58 A proportion of the PM_{10} emitted from vehicles will be fine particulates with diameters less than 2.5 micrometres ($PM_{2.5}$). Approximately 55-60% of total particulates emitted from vehicles are estimated to be $PM_{2.5}$. Therefore, at the most affected sensitive receptors, the worst case 24 hour average $PM_{2.5}$ concentration due to the Expressway is estimated to be 1.2 $\mu g/m^3$ (i.e. 60% of 2.1 $\mu g/m^3$).[30] While there is no AQNES for $PM_{2.5}$, there is a monitoring guideline of 25 $\mu g/m^3$. The maximum predicted $PM_{2.5}$ concentration due to the Expressway is well below this guideline level.

59 All predictions for other contaminants (NO_2, CO and benzene) are considerably less than the relevant standards.[31]

60 I consider that regional scale impacts on the Kāpiti airshed from the Project will be insignificant, despite a slight increase in vehicle kilometres travelled overall. This is due to improvements in traffic flow through the Project area, combined with the continuing improvements in vehicle emissions control technology and engine efficiency generally.[32]

ASSESSMENT OF CONSTRUCTION AIR QUALITY EFFECTS OF THE PROJECT[33]

61 My evidence thus far has been focussed on effects of vehicle emissions using the Expressway and associated interchanges. However, on a project of this size, construction related air quality impacts must also be considered.

62 The principal air quality issue during road construction is dust. This includes wind-blown dust from stockpiles, road dust due to vehicles travelling around the sites, and excavation and dust from disturbance of dry material.[34]

63 Dust has potential to cause effects on amenity (e.g. soiling of surfaces such as cars and houses) if adequate controls and mitigation measures are not adopted. Dust effects associated with

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29 Technical Report 13, Section 8.1.

30 Technical Report 13, Section 8.5.

31 Technical Report 13, Section 8.1.

32 Technical Report 13, Section 8.6.

33 Refer Section 5 in Technical Report 14.

34 Technical Report 14, Section 4.6.1.

such activities are difficult to quantify, as the processes are highly variable and weather dependent.

64 No disturbance of soil is proposed at the former Otaihanga landfill site. Three sites (55 Rata Road, Kāpiti Road intersection and 124-154 Te Moana Road) have been conservatively identified as contaminated[35] and are discussed in the evidence of **Dr Kerry Laing**. Where these areas are disturbed, there is the potential for minor discharges of odour and/or hazardous air pollutants.

65 The contaminants that have been identified are likely to be adsorbed onto soil particles. Therefore, methods to avoid dust nuisance will also be effective in minimising the effects of discharges of hazardous air pollutants. For example, measured concentrations of arsenic in soil samples collected from near the Kāpiti Road interchange are such that, if dust levels are maintained at or below the proposed dust monitoring target[36] of 80 µg/m^3 (as a 24-hour average), then the annual average concentrations of arsenic would be highly unlikely to exceed the NZAAQG for arsenic (0.0055 µg/m^3).[37] Based on the soil investigations carried out to date, I consider the risks of hazardous contaminants from the Kapiti Road interchange site to be minor. The Contaminated Soils and Groundwater Management Plan (which is an appendix to the CEMP)[38] contains procedures for management of contaminated material should further contamination be discovered once earthworks begins. Continuous TSP monitoring is proposed in the CAQMP at this location also. [39]

66 At 55 Rata Road, where low levels of polycyclic aromatic hydrocarbon benzo(a)pyrene (BaP) has been identified, continuous dust monitoring will be undertaken to assist dust management in this area while contaminated soils are being disturbed.[40] In practice, with good dust management in place, I do not expect that BaP will be detected in dust discharged from the site.[41]

67 There is a small potential for the diversion of landfill gas (mostly methane) from the former Otaihanga Landfill due to the siting of the Project's main construction yard on part of that site. However, adverse odour effects due to this are unlikely, since the nearest

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35 Technical Report, Section 5.2.3.

36 Technical Report 14, Section 4.3. Recommended trigger level for dust monitoring in highly sensitive areas (ref MfE Dust GPG).

37 Surface soils measured a maximum arsenic concentration of 70 µg/kg. 70 x 80 µg/m^3 =0.0056 µg/m^3.

38 Contaminated Soils and Groundwater Management Plan (Appendix K of the CEMP).

39 Technical Report 14, Section 6.2.

40 Refer CAQMP, Section 3.3.

41 I am aware of a similar situation on a road maintenance project in Auckland where BaP was identified in materials historically used as a road sub-base, but was not detected in dust samples collected adjacent to the site.

sensitive receptors are at least 250m from the construction yard.[42] Methane gas is also flammable and will be monitored by the Contractor as part of the Health and Safety Plan.[43]

68 Haulage routes for construction traffic have, wherever possible, been selected so as to minimise impacts on the surrounding community. The effects of vehicle exhausts from construction vehicles has been assessed based on Otaihanga Road between the main construction yard and SH1, which is likely to have the maximum truck movements per day. An assessment of these discharges indicates that the maximum 24-hour average concentration of PM_{10} due to construction vehicles are not predicted to cause any health-based air quality standard or guideline to be exceeded. [44]

69 As noted earlier, a draft CAQMP[45] has been prepared, which is designed to form the basis for the management plan to be prepared by contractors. The CAQMP details methods to be used to mitigate discharges of contaminants into air from the construction of the Project.[46] At the locations where construction occurs in close proximity to sensitive receptors, a high standard of emissions control and management will be employed to adequately avoid or mitigate the effects of discharges of construction dust.[47]

70 As with any construction project of this size, there may be times when there is potential for dust impacts to occur, but the CAQMP includes procedures for:

70.1 Detailed methodologies for dust control;[48]

70.2 Monitoring dust effects;[49] and

70.3 Rapidly responding to dust events.[50]

71 In my opinion, the CAQMP will provide a robust and effective mechanism to ensure that adverse air quality effects are minimised during construction so that the effects will be no more than minor.

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42 Technical Report 14, Section 7.

43 As required by standard operating procedures used by the construction contractor i.e. Fletcher Construction.

44 Technical Report 14, Section 8.1.

45 See Appendix G of the CEMP.

46 Refer CAQMP, Section 2.

47 CAQMP, Section 2.2.

48 CAQMP, Section 3.1 (which details operating and management procedures).

49 CAQMP, Section 3.3 (including visual dust monitoring and instrument dust monitoring).

50 CAQMP, Section 3.6 (detailing how complaints are handled).

METHODS FOR MANAGING EFFECTS

Construction effects

72 As explained above, in relation to air quality impacts from construction activities, the draft CAQMP details methods to be used to mitigate discharges of contaminants into air (including dust) from the construction of the Project. A high standard of emissions control and management is proposed to adequately avoid or mitigate the effects of construction dust discharges. A dust monitoring programme will also be put in place.[51]

Operational effects

73 One of the best opportunities for managing vehicle related air quality effects from SH projects is during early design and route selection. Increasing the separation distance between roads and receptors mitigates localised air quality impacts.

74 Air quality was one of a large number of factors considered in the multicriteria analysis (*MCA*) undertaken to inform the final alignment selection during the Scheme Assessment stage of the Project. When short listing route options, in my role as the air quality specialist, I gave preference to alignments that moved the road away from sensitive receptors. The existing Western Link Road (*WLR*) designation option passed close to two local primary schools[52] (within 100 metres), and would have almost certainly required the relocation of one school due to the overall impact of the Project. The MCA assessment confirmed the final proposed Expressway alignment, which does not significantly impact on the two local primary schools.

75 My conclusion is that vehicle emissions associated with the operation of the proposed Expressway are unlikely to cause exceedances of any relevant air quality criteria or to cause more than minimal adverse effects on human health or the environment.[53] Therefore, I consider that no additional mitigation of effects is required.

RESPONSE TO SUBMISSIONS

76 I have read the submissions lodged on the Project that raise air quality concerns. Where multiple submissions raise the same issue, I have grouped my response by categories. The submissions raising air quality issues fall into the following categories:

76.1 Health effects;

76.2 Operational, air pollution concerns; and

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[51] CAQMP, Section 3.3.

[52] Raumati South school and Te Ra Waldorf school.

[53] Technical Report 13, Section 8.9.

76.3 Construction dust effects.

Health Effects

77 A number of submitters[54] are concerned about the health effects of vehicle exhaust pollution and whether vehicle fumes from the Expressway will exacerbate existing health conditions. For example, Mr and Mrs Smith [011], are concerned "*that existing health conditions are going to be exacerbated by the proposed roadside pollutants*". Mr and Mrs Laird [056], are also concerned that "*…asthma …. will be worsened by such close proximity to the expressway*, and Dr Marie O'Sullivan [0675] states that "*if (her son) is exposed to poor air quality from living next to a major road, his asthma attacks may return*." I note that **Dr David Black's** evidence addresses these specific health aspects.

78 Dr O'Sullivan also raises concerns about health effects from vehicle emissions at her residence, stating "*Evidence suggests that the use of noise bunds along this section will result in a pollution surge approximately 50-80 meters from the carriageway, which would impact most severely at my residence*". There are a number of research papers which have investigated the impacts of noise barriers on roadside air quality.[55] These effects depend on many variables including wind direction, height of the barrier or bund, and the surrounding topography. In my opinion, increased turbulence and initial mixing of pollutants due to noise bunds may occur under some wind conditions, but this will not result in pollutant concentrations any higher than the roadside concentrations[56] which are reported in my evidence at paragraph 57. In all cases, the highest concentrations are predicted to be less than the guidelines.

79 Mr Riessen [0265], and Dr Kieboom [0547], who are both local GP's, are concerned about "*increased vehicle exhaust pollution"* and refer to the recent World Health Organisation (*WHO*) announcement that diesel particles have now been listed as a known carcinogen, rather than a probable carcinogen. I can confirm that the AQNES, which are mandatory standards for air quality in New Zealand, are based on WHO research and recommendations. As I have recorded elsewhere in my evidence, while at some locations, the exposure of

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[54] Including Submitters Scrimshaw [0304], Vagg [0348], Sherley [0350], Cherrington [0356], Anderson [0378], Love [0470], Whibley [0482], Implementation Group of the Kapiti Coast District Council Advisory on Cycleways Walkways and Bridleways [0485], Kieboom [0494], Frost [0496], Edbrooke [0517], Pivac [0536].

[55] *The Effects of Roadside Structures on the Transport and Dispersion of Ultrafine Particles from Highways*. Bowkera, G., Baldauf, R., Isakov, V., Khlystova, A., and Petersen, W. Atmospheric Environment,(2007),41;

Near-road air quality monitoring: Factors affecting network design and interpretation of data, Baldauf, R., Watkins, N., Heist, D., Bailey, C., Rowley, P., and Shores, R., Air Quality Atmospheric Health (2009) 2:1–9.

[56] Reported maximum concentrations are at 25 metres from the centreline of the Expressway.

people to vehicle related contaminants will slightly increase, exposure levels in all areas comply with the AQNES.

80 Other submissions[57] note the health of children as being of particular concern. For example, Kapanui School[58], which has 500 pupils, is concerned about "*increasing air pollution and increasing incidence of health issues for our youngest children*" due to increased traffic on Park Avenue which is one of the roads used to travel to and from this school. The Project will comply with national air quality standards (i.e. the AQNES), which are designed to protect the health of people and vulnerable members of society, including young children.

81 Several submitters are also concerned about the health effects of "*dust pollution*" during construction.[59] Dust discharges from earthworks are usually larger particle sizes (greater than 20 microns) which tend to settle onto the ground or surfaces (rather than being inhaled), and therefore have minimal physical health impact.[60] There may also be a component of smaller particles (less than 20 microns), which could cause some respiratory or eye irritation[61] (also discussed in the evidence of **Dr Black**). Consequently, the management of dust discharges from the construction areas (as described earlier in my evidence[62]) is a key focus of this air quality assessment.

82 The submission from Metlifecare[63], owners of the "Kāpiti Village" retirement village is concerned that *"the expressway will increase PM_{10} and $PM_{2.5}$ levels to the detriment of residents health*." I agree that the elderly residents of the Kāpiti Village are more vulnerable to the potential health effects from poor air quality. The Kāpiti airshed, like others, suffers from localised poor air quality at times, as measured at the GWRC Raumati South site during the winter of 2010. However, the proportion of particulates contributed by vehicles on these high pollution days was shown to be on average only 6%. Operation of the Expressway[64] will not add significant pollutants to the breathing space of residents in the area.

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57 Including Submitter Cairncross [0180].

58 Submitter [0415].

59 Including Submitters Kapiti Quakers [0330], Mountier [327].

60 Section 4.6.1,Technical Report 14.

61 *"Many forms of dust are considered to be biologically inert, and hence the primary effects on people relate to our sense of aesthetics",* Good practice guide for assessing and managing the environmental effects of dust emissions, p. 5, MfE, 2001.

62 Paragraphs 62-72.

63 Submitter [0608].

64 Davy, Trompetter and Markwitz, "*Source apportionment of particles at Raumati, Kāpiti Coast*", Trompetter, GNS Science Consultancy Report, 2011.

83 **Dr Black** discusses potential health effects arising from air quality further in his evidence. I am confident that potential health effects have been well assessed in the development of this Project.

Operational air pollution concerns

84 Various submissions raise more general concerns regarding "*air pollution*", "*exhaust fumes*", and "*loss of air quality*." [65] The effects of emissions from vehicles are of widespread interest, and can be significant in urban areas with large volumes of traffic.

85 There is a general perception amongst the submissions that following the Expressway's construction, air quality will be worse than the current situation, or worse than other alternatives, such as upgrading the existing SH1. In response, it is useful to understand what factors affect vehicle emissions:

85.1 Firstly, maintaining a steady flow of uncongested traffic produces fewer pollutants than stop/start traffic[66]. This is shown in the graph in **Annexure A**, which shows the relationship between vehicle emission rates and vehicle speed. On the purpose built Expressway proposed for this Project, traffic is predicted to be free flowing[67] and vehicle emissions should be less than those produced by the equivalent number of vehicles travelling on SH1.[68] This is because the existing SH1 traffic is stop/start due to the traffic lights and frequent access required on and off SH1; and

85.2 Vehicle exhaust emissions also tend to be highest when the engine is cold, and decrease significantly once the engine has warmed up. The Expressway will attract vehicles making trips longer than 5km on average[69] and therefore the Expressway will have a lower proportion of cold start vehicles, as compared to typical urban traffic flows.

86 In addition to the above factors, the principal causes of reduced air quality arising from vehicle emissions are (a) increased volumes of traffic, and (b) emissions from old and/or poorly maintained vehicles – especially diesel vehicles. With respect to those issues:

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65 See, for example, the following submissions: Wakeford [0067], Cornick [0065], Kress [0070], Bunch [0124], Kennedy [0189], Bosteels [0196].

66 Section 6.4, Technical Report 13.

67 Traffic and Transportation Assessment of Effects, Technical Report 32.

68 Technical Report 13, Appendix 13E, Tables E4 and E7, 2016 Do Minimum AM Peak PM10 emission rates for vehicles travelling on SH1 are estimated to be 0.055-0.061 g/vehicle/km. Vehicles travelling on the Expressway, 2016 With Project AM Peak is estimated to be slightly lower at 0.053-0.055 g/vehicle/km.

69 Ibid.

86.1 Submitters are concerned that the volume of traffic predicted to use the Expressway will contribute to a reduction in air quality.[70] This is a concern expressed by many residents along new road routes, such as this Expressway. However, the expected traffic volumes along the Expressway after the Project is completed are around 20,000 vehicles per day.[71] This is by no means a high vehicle flow rate. In fact, this is less than the existing traffic flow on Kāpiti Road.[72] The existing main SH1 is around 26,000[73] per day and, for context, busy motorways in Auckland carry 120,000 per day.[74] This is not a justification, simply an illustration that shows the relative magnitude of the Expressway alongside other roads in the country. A full assessment of air quality effects has been carried out, as described earlier in my evidence.[75] This has shown that the effects of vehicles travelling on this, free-flowing Expressway, are very small and do not lead to any significant adverse effects.

87 With respect to emissions from old/poorly maintained vehicles, I note that the control of vehicle emissions is the responsibility of the Ministry of Transport (*the Ministry)* and not specifically the NZTA. The Ministry has put in place a number of initiatives over the last several years including adopting overseas emissions standards for new vehicles and tightening the fuel specifications. These have assisted in bringing down the total emissions from the vehicle fleet in New Zealand and vehicle emissions will continue to reduce as the older vehicles are removed from the fleet and newer cleaner models are brought in. Agencies such as the NZTA and local Councils can – and do – play their part when designing new routes, such as the one proposed here.

88 In considering the issues of traffic volume and fleet age/condition with respect to the Expressway, I conclude that the operation of the Project will not significantly change the existing air quality in the Kāpiti area. I do not consider that ongoing monitoring of air quality (as has been suggested by several submitters)[76] is necessary.

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70 For example, Vagg [0348], McKay [0402].

71 Expressway north of Kāpiti Interchange (2026) is 20,000 vehicles/day.

72 Average weekday traffic volume on Kāpiti Road is 21,900 vehicles/day (Technical Report 32).

73 SH1 north Of Ihakara St (Paraparaumu) 2010, Table 3.4, Technical Report 32.

74 Daily traffic volumes predicted to travel on SH16 in 2016 (Waterview Connection G.1 Assessment of Air Quality Effects).

75 Paragraphs 57-59.

76 For example, Ryan, [0156], O'Sullivan [675].

Construction Dust Effects

89 Construction dust effects have been raised by a large number of submitters.[77] These effects have been covered in detail in Technical Report 14.[78] This component of the assessment process is more detailed than most, reflecting the anticipated public concern. It is very specific and prescriptive on all aspects of the construction work that might lead to dust, odour, vehicle exhausts, or other air quality effects during construction. The construction issues are also covered to a significant degree in the provisions of the draft CAQMP, together with the proposed consent conditions (DC.26 to DC.29) (attached in **Annexure B**).

90 In addition, there are requirements in the proposed conditions for dust monitoring (see DC.26) in the most sensitive locations and considerable emphasis has been placed in the draft CAQMP on rapid responses to, and mitigation of, any dust problems that arise. For example, dust monitoring will be capable of triggering alarms via cell phone or pager.[79]

91 The submission by P and M Smith [011] raise specific concerns relating to construction dust impacts on washing hanging outside and the ability to enjoy summer barbeques, due to their dwelling's proximity to the construction of the Kāpiti Road interchange. The management approach specified in the CAQMP is based on controlling dust so that adverse effects do not occur. In my experience, if the correct dust management procedures are followed, there will be no dust deposited on laundry hanging outside.

92 The staging of works around Kāpiti Road is described in **Mr Goldie's** evidence on construction methodology and he outlines how this work is programmed to occur outside of the Spring Equinox period.[80] Also, dust monitoring will be carried out in the area around the Kāpiti Road Interchange and Mazengarb Road throughout the construction period[81], which recognises that there are number of houses in this area which will be within 100 metres of the construction work. Locations within 100 metres of the

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77 For example, Pears (4], Cornick [65], Watson (126], Hare [209], Evans [211], James and Tong [228], Waterson [267], Scrimshaw [304], Pomare [309], Harrison [323], Mounteir [327], Keno [357], MacKay [402], Eggers [410], Lepionka [416], Baxter [422], Gray [424], Inge [429], Pritchard [437], Love [470], Waikanae Property Development Limited [474], Whibley [482], Paraparaumu/Raumati Community Board [501], Allan [502], Edbrooke [517], White [522], Ellis [534], Houston and Lord [566], Arnold [567], Connal [616], Neilson and Alexander [619], O'Sullivan [675].

78 Sections 5.0 – 8.0.

79 Refer Sections 3.1 and 3.3 of the CAQMP.

80 Spring Equinox is when many areas in New Zealand experience westerly gales from around mid September to early November. Both rainfall rate and wind speed are meteorological conditions having the greatest impact on dust dispersion. Therefore, dust management during summer is also very important.

81 Sections 3.1 and 3.3 of the CAQMP.

construction activities are considered most at risk of dust effects. Dust particles generated from construction activities, which cause nuisance or amenity effects, are usually greater than 100 microns and due to this size, tend to settle out within tens of meters of the source.[82]

93 Other specific dust related concerns include "*impacts on vegetables and fruit*",[83] "*dust from haul roads*",[84] "*dust affecting vegetable garden and fruit trees*",[85] and "*wind blown sand*".[86] At high dust loadings, for example where leaves are completely covered in dust, photosynthesis may be inhibited and the health of plants may be affected.[87] The dust control measures and monitoring that are prescribed in the proposed consent conditions are designed to minimise construction dust so that such effects do not occur. These measures include water sprinklers on haul roads, stockpiles or spoil heaps during dry weather. Continuous dust monitoring[88] will be moved to sensitive locations as the construction progresses, and will be located on the southern side of the construction area, as northerly and north-easterly winds are most common during the summer.

94 One submitter[89] is concerned about proximity to the main contractor's yard at Otaihanga , however, no residential dwelling is located within 250 metres of this site. This is a significant distance for ameliorating any dust effects. For instance, there are (and have been) many locations throughout the country where residences are within a few tens of metres from the likes of quarries, stockpiles, timber yards, railways and similar dust producing activities. At distances of up to 50m these locations can experience some dust nuisance effects, but this falls off rapidly with distance and beyond 100m the effects are generally minor. With all of the tight controls applied in this case[90], I would expect dust effects at 250m from the main contractor's yard to be no more than minor.

RESPONSE TO SECTION 149G(3) KEY ISSUES REPORTS

95 I have reviewed the Key Issues Reports prepared by Kāpiti Coast District Council (*KCDC*) (dated 8 June 2012) and GWRC (dated

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82 MfE Dust GPG.

83 Hager and Laird [056].

84 Schwass [531].

85 Pivac [536].

86 Dearden [261].

87 *An Assessment of the Effects of Road Dust on Agricultural Production Systems* (McCrea, 1984). This research was based on uncontrolled dust effects from unsealed roads.

88 Total Suspended Particulate (TSP) monitoring.

89 R Mansell [0203].

90 See condition DC.26.

11 June 2012), which have been prepared pursuant to section 149G(3) of the Resource Management Act 1991 (*RMA*).

96 I note that the GWRC Report[91] confirms that no resource consents are required for the Project under the Regional Air Quality Management Plan or in relation to the AQNES. No substantive air quality issues are raised, in either report.

RESPONSE TO BOI'S SECTION 92 REQUEST

97 I have reviewed the section 92 RMA request made by the BoI (by letter dated 7 August 2012) (*the section 92 request*) and in this section of my evidence I will address matters identified in Appendix One to that letter, which relate to air quality.

98 The section 92 request seeks that further comment be provided on the following matters:

98.1 Cumulative assessment of $PM_{2.5;}$

98.2 Use of topography in the dispersion modelling;

98.3 Exclusion of monitoring data from the GWRC Raumati South site;

98.4 A community exposure assessment;

98.5 Modelling of worst case emissions;

98.6 Sensitivity analysis or estimate of uncertainty;

98.7 Identification of proposed construction activities likely to have discharges to air; and

98.8 Proposed assessments/monitoring of identified contaminated sites and proposed monitoring of hazardous contaminants.

99 I address each of these issues as follows.

Cumulative assessment of $PM_{2.5}$

100 The section 92 request queries why $PM_{2.5}$ has not been cumulatively assessed in modelling. There is a very limited amount of background $PM_{2.5}$ data for the Kāpiti region. Currently there is also no AQNES, NZAAQG or GWRC AAQG for $PM_{2.5}$. For this reason, a cumulative assessment of $PM_{2.5}$ is difficult.

101 The GWRC Raumati South Site data was collected over 9 weeks, which is a relatively short duration, and recorded 13 exceedances of

[91] At paragraphs 97 and 106 respectively.

the $PM_{2.5}$ monitoring guideline[92] of 25 µg/m³. The mean $PM_{2.5}$ concentration was 15.7 µg/m³ and the maximum was 54.6 µg/m³.

102 The estimate of worst case additional $PM_{2.5}$ contributed by vehicles using the Expressway is 1.2 µg/m³ (which is discussed earlier in my evidence[93]). The cumulative effect of $PM_{2.5}$ emissions from the Expressway, when combined with the highest measured $PM_{2.5}$ is small (i.e. an increase of 2%).

103 These high background concentrations of $PM_{2.5}$ (and PM_{10}) are most likely to occur at night, generally after 11 pm. Since there is very little traffic around at this time, these peaks are due to home heating emissions, which are beyond the control of the NZTA. Whilst these results are no doubt representative of air quality in that urban location with a high density of solid fuel home heating[94], it is inaccurate to apply that measured worst case data to every urban location in the Kāpiti region.

Use of topography in the dispersion modelling

104 The AUSROADS model which has been used in my assessment is widely used throughout Australasia and is recognised in the MfE Good Practice Guide for Atmospheric Dispersion Modelling (MfE, 2004). AUSROADS uses comparatively simple methods to account for terrain and building effects on pollutant dispersion. Various parts of the Expressway are modelled as either "elevated", "depressed" or "a bridge", according to the proposed civil geometric design.

105 Models that can account for complex terrain, such as The Air Pollution Model (TAPM), CALPUFF (an advanced 'puff' dispersion model) and ADMS-Roads are designed to include large-scale terrain features (such as the Tararua Ranges to the east of the Project area), rather than the 'micro-terrain' in the immediate vicinity of the Expressway.

106 Therefore, it is a limitation of most of the commonly used road dispersion models in New Zealand (such as CALINE-4 and AUSROADS), that small changes in local topography cannot be accurately simulated. In my opinion, since discharges from motor vehicles are of neutral buoyancy and exhaust discharges are close to the ground, the influence of small changes in the Kāpiti terrain are unlikely to have a significant effect on predicted contaminant concentrations.

Exclusion of Monitoring data from GWRC Raumati South site

107 The section 92 request queries why monitoring data from the GWRC Raumati South site appears to be excluded. This data is discussed in paragraphs 30 - 33 of my evidence and Appendix 13.B of Technical Report 13.

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92 NZ Ambient Air Quality Guidelines (2002).

93 Paragraph 58.

94 Greater than 400 g/ha/day (ref NIWA, 2009).

108 A lack of site specific data is often a problem in air quality assessments. Recognising this, and on my recommendation, the NZTA established an ambient air quality monitoring site very close to the proposed alignment of the Expressway and operated it continuously for 12 months (this is the Raumati Road Site, discussed at paragraph 31 of my evidence). The highest concentrations measured at this site were used in the cumulative effects assessment and I regard them as being more representative of the maximum background concentration along the whole Expressway alignment, as compared to the GWRC Raumati South site.

109 Existing ambient air quality inevitably has spatial and gradient variations, due to differences in land use and topography which affect dispersion. The GWRC report[95] states that:

> *"Raumati South (in particular the Glen road area) is located within a low- lying area with topography that may be conducive to restricting the dispersion of pollutants under still and cold conditions."*

110 In my opinion, the 9 weeks of monitoring that GWRC conducted at the GWRC Raumati South Site is not representative of the likely air quality in close proximity (i.e. within 100 metres) of the majority of the future Expressway. However, I acknowledge that in some localised residential areas if dispersion is confined, there is the possibility that existing winter time PM_{10} concentrations under periods of sustained calm weather and very cold overnight temperatures could be high or even exceed the AQNES. This is the situation with airsheds in other locations in the Wellington region, such as Wainuiomata or Masterton.

111 I note that a source apportionment study was carried by GNS Science[96] to determine what is contributing to these high concentrations at the Raumati South site. This showed that motor vehicles contribute 6% of the total PM_{10}, whereas biomass burning (home heating) emissions account for over 50% of all PM_{10} measured.[97] I do consider that the exceedance levels for PM_{10} and $PM_{2.5}$ in Raumati South and potentially other locations in the Kāpiti region need to be managed in order to mitigate potential health effects. However, the level of contribution to PM_{10} and $PM_{2.5}$ from this Project is extremely small. Contributions of these contaminants are completely dominated by other sources – especially the public's use of wood burners for home heating.

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95 Greater Wellington Regional Council, Raumati South air quality investigation. Winter 2010 particulate matter concentrations and sources, April 2011.

96 Davy, Trompetter and Markwitz, "*Source apportionment of particles at Raumati, Kāpiti Coast*", Trompetter, GNS Science Consultancy Report, 2011.

97 Marine aerosol (sea salt) contributed just under a third. Davy, Trompetter and Markwitz, "*Source apportionment of particles at Raumati, Kāpiti Coast*", Trompetter, GNS Science Consultancy Report, 2011.

Community exposure assessment

112 The section 92 request referred to a community exposure assessment as recommended by the MfE Transport GPG and sought confirmation if this was intended to be undertaken for the Project. Although it is not strictly necessary to carry out such an assessment on the basis of the recommendations in the MfE Transport GPG[98], in response, I can confirm that a community exposure assessment of the total potential health effects from the Project's air emissions is being undertaken. In summary, this community exposure assessment will look at the average change in PM_{10} concentrations across the population exposed.

113 While it the assessment could not be completed in time to be provided with my evidence in chief, I anticipate that it will be available by 14 September 2012.

Modelling of worst case emissions (congested traffic)

114 A "high traffic day" scenario is described in my evidence (paragraph 46) and in Technical Report 13.[99] As an air quality expert, I rely on the expert traffic engineers (in this case **Mr Murray**) to provide the information on a project's predicted traffic flows. The Expressway is predicted to be free- flowing (not congested,) even under the "high traffic day" scenario. This scenario has been defined by the traffic modelling, which in turn is based on actual traffic count data measured on SH1 at Waikanae in 2009.[100]

115 A 10% increase in traffic volume travelling at the Expressway posted speed of 100 km/hr raises vehicle emissions by 10%, and the effects due to those emissions increase by 10% also. For just one key parameter – 24 hour PM_{10} (where the AQNES standard is 50 $\mu g/m^3$), the maximum predicted cumulative concentration would increase from 36.0 $\mu g/m^3$ to 36.2 $\mu g/m^3$.[101] Therefore, even on a high traffic day, all relevant health based air quality guidelines are predicted to be complied with.

Sensitivity analysis

116 The section 92 request noted that "*No sensitivity analysis nor any estimate of uncertainty appears to have been provided. This is a requirement of both the NZTA standard and the MfE Transport Guide*."

117 In response, I note that a sensitivity analysis of traffic flows is described above (at paragraph 46). This shows that the final cumulative concentrations of PM_{10}, even at the worst locations, are not greatly sensitive to the specific traffic flow parameters for the

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98 The MfE Transport GPG states: *"In some situations it may be necessary to undertake a more comprehensive air pollution health risk assessment as part of a detailed study. For example when predicted effects exceed ambient air quality criteria..."* As discussed elsewhere in my evidence, the Expressway is not predicted to exceed ambient air quality criteria.

99 Sections 6.3 and 8.7.

100 Refer to the evidence of **Mr Murray** for a discussion of the traffic modelling undertaken.

101 Section 8.7, Technical Report 13.

Project. Instead, the effects are strongly dominated by the existing air quality.

118 An assessment of uncertainty has been discussed in Technical Report 13.[102] Uncertainty arises from the use of a number of layers of models, (meteorological models, traffic models and dispersion models). Quantifying how much higher or lower the predicted concentrations might be is extremely difficult. However, to compensate for this the modelled concentrations are reported at the maximum and highest 99.9 percentile out of data for a whole year. Also, I note that even if concentrations were double what is predicted, they would be unlikely to cause exceedances of any air quality standard or guideline.

Identification of proposed construction activities likely to have discharges to air

119 The section 92 request asks for identification of proposed activities likely to have discharges to air, including establishment of a main construction yard on an existing landfill and the re-routing of a natural gas pipeline.

120 The proposed construction activities that are likely to generate dust are described in detail, and sector by sector, in Technical Report 14 and in the evidence of **Mr Andrew Goldie**.

Assessment of effects of landfill gas [103]

121 The Otaihanga Road landfill site is a closed landfill (closed in 2007), and it is proposed to locate temporary buildings on this site as part of the Project's main construction yard.

122 Landfill gas is made up of approximately 50% methane and 50% CO_2, plus traces of other compounds. Methane and CO_2 are generally not of concern from the point of view of toxicity, they are asphyxiants, that is, they displace or dilute air and reduce oxygen concentrations in confined spaces, such as trenches or buildings. Trace gases do not normally represent a hazard once they have been diluted in the atmosphere[104]. Methane is also flammable. At most landfills (i.e. Otaihanga), landfill gas is passively vented.

123 I consider that the risk of landfill gas adversely affecting the health of construction workers to be low. Methane levels will be checked when the construction yard is established through the requirements of the Health and Safety Plan.[105]

Assessment of effects of re-routing of the natural gas pipeline

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[102] Section 8.8.

[103] As discussed at paragraph 64 above, I note that there will be no earthworks proposed at the construction yard, arising from construction of temporary buildings etc (e.g. portacabins). Hence, there will also be only minor discharges of dust associated with the yard's establishment.

[104] A Guide for the Management of Closing and Closed Landfills in New Zealand, MfE 2001.

[105] As required by standard operating procedures used by the construction contractor i.e. Fletcher Construction

124 The construction related activities required to re-route the Vector gas supply pipeline north of Waikanae River are described in the AEE.[106] Potential discharges to air from this activity includes dust from excavation of pipe trenches, and the potential for minor odour[107] discharges due to small amounts of gas being vented during the process. As this is a critical piece of infrastructure, it will be necessary to complete these works quickly. As a consequence, the potential air quality effects will be of short duration and relatively minor in nature.

Proposed assessments / monitoring of identified contaminated sites and proposed monitoring of hazardous contaminants

125 The section 92 request sought comment on whether there were any air quality assessments or monitoring proposed of the three identified contaminated sites, including proposed monitoring for hazardous contaminants.

126 The three contaminated sites and proposed TSP monitoring at these locations are described earlier in my evidence.[108]

127 Routine monitoring of hazardous air pollutants at the three contaminated sites referred to earlier in my evidence (paragraph 64) is simply not practical. There is no practicable method for real time sampling and analysis of dust (particulate matter) that could contain benzo(a)pyrene or arsenic. Methods currently available involve sending dust filter samples for laboratory analysis which can take at least 3 to 5 days.

128 The monitoring approach outlined in Technical Report 14[109] is for continuous TSP monitoring at the 55 Rata Road site while excavation of contaminated fill is undertaken. If dust (TSP) is being appropriately controlled and managed, then the levels of other contaminants that could be contained in the dust should also be managed to a safe level.[110] There is a very minor risk of elevated levels of benzo(a)pyrene in dust from the Rata Road site, and some of these TSP samples will be sent for analysis as a double check that contaminant levels are not exceeding the relevant health based guidelines for construction workers and the general public.[111]

PROPOSED CONDITIONS

129 The suite of proposed conditions lodged with the Project contains conditions relevant to Construction Dust Management – proposed

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106 AEE, Section 15, Network Utilities.

107 Small amounts of mercaptans are used as an odour to assist with the detection of natural gas.

108 Paragraphs 64-66.

109 Technical Report 14, Section 6.2.

110 Technical Report, Sections 5.2.3 and 5.3.4.

111 Section 3.3.2, CAQMP.

designation conditions DC.26 to 29. [112] These conditions relate to the potential nuisance effects from dust generated during the construction period.

130 Proposed condition DC.26 requires that the draft CAQMP be finalised and implemented prior to bulk earthworks being undertaken. The CAQMP is required to provide a methodology for managing the effects of dust onsite and must include the following details:

130.1 Visual monitoring of dust emissions;

130.2 Methods to be used to limit dust and odour nuisance;

130.3 Procedures for responding to process malfunctions and accidental dust discharges;

130.4 Criteria, including consideration of weather conditions and procedures for use of water sprays on stockpiles and operational areas of the site;

130.5 Continuous Monitoring of TSP concentrations and meteorology;

130.6 Monitoring of the times of offensive odour emissions from the ground;

130.7 Procedures for responding to discharges of odour (including in the event of excavation of contaminated sites);

130.8 Monitoring of construction vehicle maintenance.

130.9 Process equipment inspection, maintenance, monitoring and recording;

130.10 Complaints investigation, monitoring and reporting; and

130.11 The identification of staff and contractors' responsibilities.

131 Additional conditions to manage potential air quality effects include:

131.1 Unless expressly provided for by conditions of this consent, there shall be no odour, dust or fumes beyond the site boundary caused by discharges from the site which, in the opinion of an enforcement officer, is noxious, offensive or objectionable (DC.28).

131.2 Beyond the site boundary there shall be no hazardous air pollutant caused by discharges from the site that causes, or is

[112] A copy of the proposed conditions is attached to my evidence as **Annexure B** for ease of reference.

likely to cause, adverse effects on human health, environment or property (DC.29).

132 I consider that these proposed conditions are appropriate to adequately manage the potential air quality construction effects of the Project. Given my conclusion above that no further mitigation of operational air quality effects is required, it follows that no conditions are proposed for operational air quality effects.

CONCLUSIONS

133 In some locations, the Project is predicted to slightly increase the exposure of people living, working or spending time in the Project area to vehicle related contaminants above the "Do Nothing" scenario (i.e. without the Project). However, the air quality assessment shows that, with the Project in place, exposure levels in all areas will comply with the AQNES which are designed to protect the health of the most vulnerable individuals in the community.

134 In my opinion, the operation of the proposed Expressway will have only a minor effect on both the local and regional air quality. For many areas, the redistribution of traffic flows from the local roads to a free flowing Expressway will result in better air quality than would occur otherwise, particularly on the existing SH1.

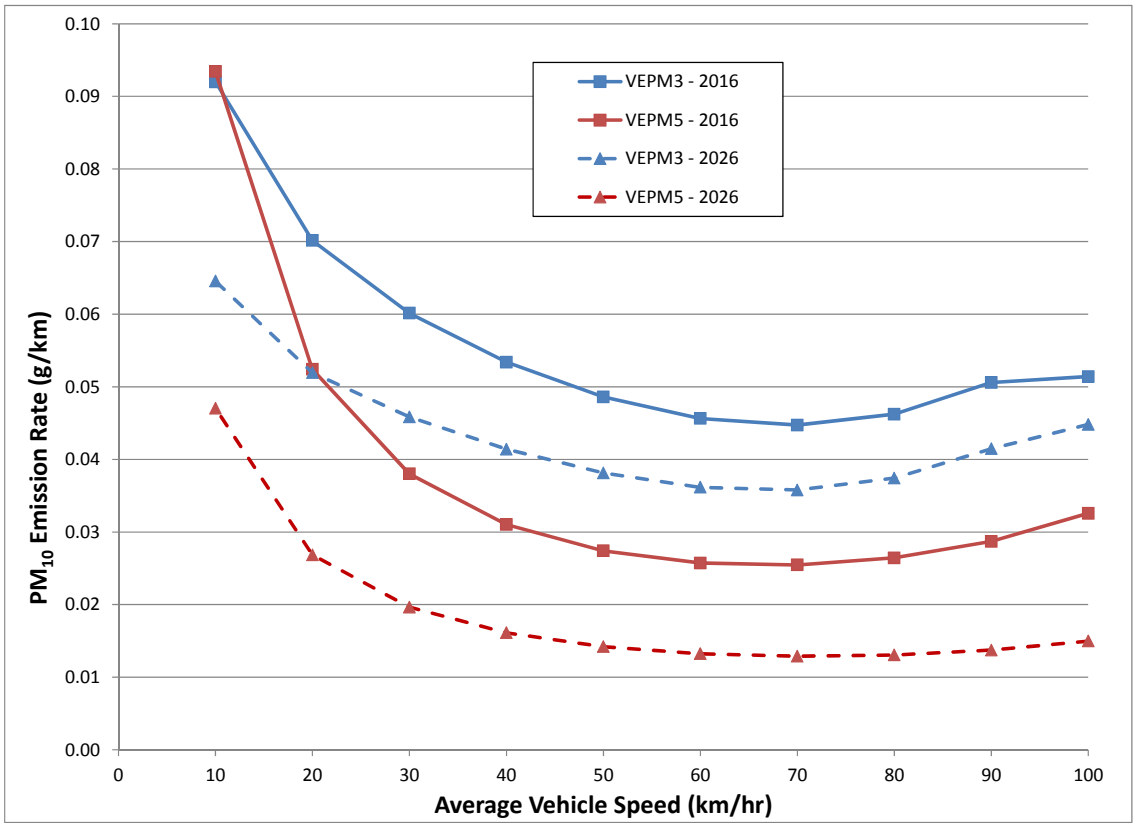
135 Dust will be generated during the construction phase of the Project. In my opinion, the CAQMP will provide a robust and effective mechanism to ensure that adverse effects are minimised so that no serious adverse affects on local communities will eventuate.

_____
Camilla Borger
5 September 2012

ANNEXURE A: CHANGES IN VEHICLE EMISSION RATES

The following graph shows the effects of vehicle speed, age of vehicle fleet (2016 versus 2026), and compares the vehicle emission models, VEPM 3.0 with VEPM 5.0.[113]

(A similar shaped graph occurs for other parameters e.g carbon monoxide and nitrogen oxides).



[113] VEM 3.0 refers to Vehicle Emissions Prediction Model v3 (2009) and VEM 5.0 refers to Vehicle Emissions Prediction Model v5 (2012). VEPM 5.0 is the latest version of this model.

ANNEXURE B: PROPOSED AIR QUALITY CONDITIONS

	Construction Dust Management
DC.26	(a) The NZTA shall finalise and implement, through the CEMP, the Construction Air Quality Management Plan (CAQMP) submitted with the application. The purpose of the CAQMP shall be to establish procedures for monitoring the discharge of particulates into the air during construction, methods to be used to limit dust and odour nuisance, and procedures for responding to any complaints and events. (b) The CAQMP shall be provided to the Manager, at least 15 working days prior to bulk earthworks being undertaken, for review and certification that the CAQMP includes the following details: (i) Visual monitoring of dust emissions; (ii) Methods to be used to limit dust and odour nuisance (iii) Procedures for responding to process malfunctions and accidental dust discharges; (iv) Criteria, including consideration of weather conditions and procedures for use of water sprays on stockpiles and operational areas of the site; (v) Continuous Monitoring of Total Suspended Particulate (TSP) concentrations and meteorology; (vi) Monitoring of the times of offensive odour emissions from the ground; (vii) Procedures for responding to discharges of odour (including in the event of excavation of contaminated sites); (viii) Monitoring of construction vehicle maintenance; (ix) Process equipment inspection, maintenance, monitoring and recording; (x) Complaints investigation, monitoring and reporting; and (xi) The identification of staff and contractors' responsibilities.
DC.27	The NZTA shall review the CAQMP at least annually and as a result of any material change to the Project. Any consequential changes will be undertaken in accordance with Condition DC.10.
DC.28	Unless expressly provided for by conditions of this designation, there shall be no odour, dust or fumes beyond the site boundary caused by discharges from the site which, in the opinion of an enforcement officer, is noxious, offensive or objectionable.
DC.29	Beyond the site boundary there shall be no hazardous air pollutant caused by discharges from the site that causes, or is likely to cause, adverse effects on human health, environment or property.